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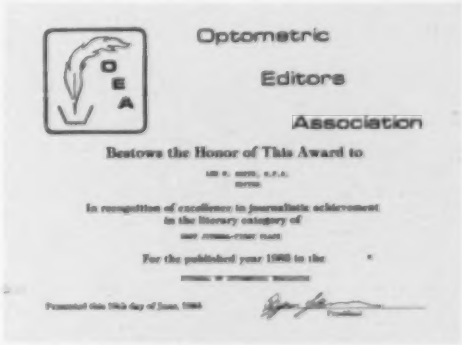

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On the Cover: 1984 SCCO Graduates Karen K. Toki, O.D., Elaine S. Fong, O.D., and Rosemary Hum, O.D.

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Part I: Demography and Practice Characteristics

A Survey of Optometry Graduates to Determine Practice Patterns

Robert L. Bleimann, Ph.D.
Lee W. Smith, M.P.H.

This article is a summary of a two-volume study of optometry graduates conducted by ASCO. The data, which were produced from a survey of these graduates, covered new ground about various aspects of recently graduated O.D.'s experience in obtaining a state license, becoming established in practice and their practice characteristics. ASCO considered it important to publish a summary article of this large report in order to disseminate this important information within the profession. However, the resulting article was found to be too long to be included in a single issue of JOE. Therefore, the article is presented in two parts, as follows: Part I includes the background to the survey, demographics of the respondents and their practice characteristics; Part II includes the analysis of the graduates' licensure and practice establishment experiences. Part I of this article was written by Lee W. Smith, M.P.H., while Part II was written by Robert L. Bleimann, Ph.D. Part II will appear in the Winter 1985 Issue of JOE.

Introduction

Following a competitive bid process, the Association of Schools and Colleges of Optometry (ASCO) was awarded a contract in September 1981 to conduct a survey of optometry graduates of the years 1979, 1980 and 1981. This contract and a subsequent amendment ran for a two-year period and required ASCO to collect and analyze data from the graduates of the specified years to determine the following:

- their experience with the National Board of Examiners (NBEO)
- examination and the state board licensure process
- delays encountered with the licensing procedures and reasons therefor
- their experience in establishing themselves in the optometric profession
- geographic location and practice modes
- future practice plans; and
- their professional relationship with ophthalmologists and other health practitioners.

To some extent the survey project also was to be a follow-up study to a national survey of some 22,000 practicing optometrists conducted by the American Optometric Association (AOA) in 1978. This earlier study collected data about the practice mode and the demographics of the practitioners.

During the period covered under the contract some 3,100 individuals had graduated from the then 13 schools and colleges of optometry. In view of the relatively small size of the group it was decided to survey this total universe of graduates.

The following schools were included in the survey: Ferris State College of Optometry (FSC); Illinois College of Optometry (ICO); Indiana University, College of Optometry (IU); New England College of Optometry (NECO); Pennsylvania College of Optometry (PCO); Pacific University, College of Optometry (PU); Southern California College of Optometry (SCCO); Southern College of Optometry (SCO); State University of New York, College of Optometry (SUNY); The Ohio State University, College of Optometry (TOSU);

Robert L. Bleimann, Ph.D. is presently a staff member of the American Optometric Association and was project manager for the contract while serving with ASCO. Lee W. Smith, M.P.H. is executive director of the Association of Schools and Colleges of Optometry and served as project director for the contract.

TABLE 1
Final Results of the Survey by Year of Graduation

		Responses		Non-responses		
Year of Grad.	Year Total	No.	Percent	Number Non-Responses	Number Not Delivered	Percent
1979	1017	721	70.9	264	32	29.1
1980	1034	743	71.9	247	44	28.8
1981	1081	813	75.2	247	21	24.8
Totals	3132	2277	72.7	758	97	27.3

University of Alabama, Birmingham, School of Optometry (UAB); and University of Houston, College of Optometry (UH). The names and addresses of the graduates of each of the three years under study were obtained from each of the participating optometry schools. A master address list of graduates was prepared and verified and 3,067 questionnaires were actually mailed.

The response to the survey was gratifying in that 2,275 usable responses were received, representing some 72.0% of the population. A review of the respondent group against other available data, namely the annual Council on Optometric Education survey, indicated that it was representative of the total population in relation to the ratio of male and female graduates and nearly so in racial/ethnic mix. It should be noted, however, that it was impossible to test whether any bias existed as a result of the self-selection process in responding to the questionnaire. It is possible that nonrespondents, such as those not successfully achieving licensure, may not be randomly distributed in the sample population. The distribution of respondents and nonrespondents from the cohort group is presented in Table 1.

General Demographic Characteristics

Of the 2,275 respondents to the survey 84.0% were males while females composed 16.0%. This percentage figure underscores the significant increase in the number of female optometrists in the 1970s. For instance, women composed 2.2% of graduates in 1968, 12.1% in 1979, 20.1% in 1981. Recent entering classes of optometry students are in excess of 38.0% female. In addition, women are functioning in the profession to the same extent as their male counterparts. The percentages are 98.7% males versus 97.5% for females of the respondents to the survey. Therefore, while it has been held by many in the profession that women frequently were lost to the profession for personal or family reasons, our data do not support this hypothesis for their early years in practice.

The average age of the respondents at graduation was 27.5 years with no significant variation among the three graduating classes (or cohorts). A significant number (64) of individuals received their O.D. degree past age 35, however. This would appear to represent a group of individuals who have sought a mid-life career change.

The racial/ethnic composition of the graduates indicates that minorities compose about 6.6% of the respondents. The proportion of minority to white graduates in the optometric profession has not changed significantly in recent years. Asians accounted for almost two-thirds of the minority graduates, with Blacks placing second in the survey data. Recent data, however, from the Council on Optometric

TABLE 2
Distribution of Practitioners by State

State	1978 AOA Data	Percent	1983 ASCO Data	Percent
Alabama	214	1.04	41	1.87
Alaska	24	.12	6	.27
Arizona	175	.85	25	1.14
Arkansas	187	.91	19	.87
California	2784	13.47	301	13.70
Colorado	248	1.20	30	1.37
Connecticut	271	1.31	28	1.28
Delaware	39	.19	4	.18
DC	53	.26	11	.50
Florida	603	2.92	86	3.91
Georgia	311	1.51	49	2.23
Hawaii	78	.38	15	.68
Idaho	104	.50	12	.55
Illinois	1679	8.12	104	4.73
Indiana	592	2.86	61	2.78
Iowa	345	1.67	26	1.18
Kansas	276	1.34	20	.91
Kentucky	249	1.21	40	1.82
Louisiana	244	1.18	31	1.41
Maine	137	.66	17	.77
Maryland	213	1.03	42	1.91
Massachusetts	746	3.61	67	3.05
Michigan	843	4.08	90	4.10
Minnesota	356	1.72	30	1.37
Mississippi	122	.59	16	.73
Missouri	424	2.05	30	1.37
Montana	108	.52	9	.41
Nebraska	160	.77	16	.73
Nevada	50	.24	10	.46
New Hampshire	85	.41	9	.41
New Jersey	733	3.55	50	2.28
New Mexico	94	.45	23	1.05
New York	1617	7.82	128	5.83
No. Carolina	364	1.76	56	2.55
No. Dakota	79	.38	19	.87
Ohio	1000	4.84	97	4.42
Oklahoma	287	1.39	34	1.55
Oregon	337	1.63	39	1.78
Pennsylvania	1220	5.90	106	4.83
Rhode Island	121	.59	7	.32
So. Carolina	189	.91	23	1.05
So. Dakota	86	.42	7	.32
Tennessee	404	1.95	38	1.73
Texas	891	4.31	127	5.78
Utah	83	.40	12	.55
Vermont	48	.23	6	.27
Virginia	342	1.65	35	1.59
Washington	396	1.92	47	2.14
West Virginia	147	.71	27	1.23
Wisconsin	465	2.25	59	2.69
Wyoming	48	.23	12	.55
TOTAL	20671	100.01	2197	100.07

Education Annual survey, indicate that Hispanic enrollment is on the increase.

Geographic Distribution

It was deemed useful to compare the geographic distribution of the graduates surveyed with the data collected in the 1978 inventory of optometrists. Table 2 indicates the number and percent of practicing optometrists by state, according to the 1973 inventory data, and compares this to the recent graduates. This comparison indicates that, by and large, new practitioners establish themselves in states in roughly the same proportion as existing practitioners. There were some differences which were considered significant, however, and Table 3 is presented to demonstrate those states showing a percentage increase or decrease of plus or minus 0.5%. ASCO considered this figure to be a measure of practical significance. While ten states registered an increase in the number of O.D.'s, six attracted fewer practitioners from the survey group. The table clearly shows the decreases are dramatically larger than the increases.

Further analysis of the table yields some interesting comparisons. The national average of optometrists to population is 9.73 O.D.'s per 100,000 population. Of those states where an increase in the number of optometrists is noted, all but two fell significantly short of this average level. One exception, North Carolina, can perhaps be traced to the broader legal authority for practice in that state. It is noteworthy that these states fall in the general region of the sun belt. In contrast, the greatest decline in population is found in states where the O.D. population ratio is either near or above the average. Each of these is a Northern industrial state.

Practice Characteristics

In an attempt to provide an update of the 1978 survey, questions were included which were almost identical to those in the 1978 questionnaire. Data were collected about the following topics:

- professional status in optometry for both principal and secondary employment
- occupational mobility
- practice characteristics; and
- geographic mobility

Professional Status

Employment status for the purposes of the analysis was divided into four categories: self-employed, salaried in a clinical setting, salaried in a non-clinical setting and other. The data on employment status are included in Table 4. It can be seen that the most common form of employment is self-employment, with 54.3% of respondents. Salaried employment in a clinical setting amounts to 39.5% of the respondents. Only 4.8% are functioning in other than a clinical setting. When the data are broken

TABLE 3
Comparison of States Gaining and Losing Optometrists

State	Percent Increase	O.D.'s per 100,000	State	Percent Decrease	O.D.'s per 100,000
Alabama	.83	5.79	Illinois	3.39	15.00
Florida	.99	7.15	Mass.	.56	12.94
Georgia	.72	6.22	Missouri	.68	8.80
Idaho	.55	12.08	New Jersey	1.27	10.03
Kentucky	.61	7.22	New York	1.99	9.08
Maryland	.88	5.20	Penn.	1.17	10.37
New Mexico	.60	7.91			
N. Carolina	.79	12.36			
Texas	1.47	6.98			
W. Virginia	.52	7.92			

TABLE 4
Percent of Respondents Indicating Principal Employment According to Category of Employment Type (Summary of Table 9-1)

	Total	1979	1980	1981
Self-employed	54.3%	62.8%	57.5%	43.5%
Salaried in a clinical setting	39.5%	32.3%	36.7%	49.0%
Salaried in a non-clinical setting	4.8%	3.3%	4.6%	6.0%
Other	1.5%	1.5%	1.1%	1.8%

TABLE 5
Principal Employment by Sex of Respondent According to Category of Employment Type (Summary of Table 9-5)

	Male	Female
Self-employed	57.5	50.6
Salaried in a clinical setting	37.6	40.5
Salaried in a non-clinical setting	3.7	6.6
Other	1.1	2.4

out by cohort one notices that the number of self-employed practitioners increases rather sharply from the first year after graduation (43.5% in 1981) to 62.8% in the third year after graduation. Conversely, the number of graduates in a salaried position decreases over time, in about the same proportion as the increase in the self-employed category.

There has been concern expressed in the profession over the alleged number of new graduates entering the commercial practice of optometry, i.e., employed by an optical company. The data collected in this survey do not support this contention insofar as less than 7.0% of the respondents reported that they worked for an optical company. The data from this survey show the trend among recent graduates is in the direction of seeking self-employment.

When the data on employment status response by sex (Table 5) are examined, one notes that among the respondents there appears to be a somewhat higher inclination of men to enter self-employed status than the women graduates. Analysis

TABLE 6
Patient Referrals by Respondents to Other Health Care Professionals by Cohort

	YEAR OF GRADUATION			
Referrals to:	**TOTAL**	**1979**	**1980**	**1981**
Optometrists	1485 68.8%	513 73.3%	507 72.0%	464 61.7%
Ophthalmologists	2122 98.4%	686 98.0%	698 99.1%	737 98.0%
Other M.D.'s	1850 85.8%	612 87.4%	612 86.9%	625 83.1%
Health Professionals	890 41.3%	353 50.4%	304 43.2%	233 31.0%
Non-health Professionals	441 20.4%	182 26.0%	134 19.0%	125 16.6%
None of the Above	12 .6%	4 .6%	2 .3%	6 .8%
Analyzed Respondents	2157 315.3%	700 335.7%	704 320.5%	752 291.2%

TABLE 7
Patient Referrals by Other Health Care Professionals to Respondents by Cohort

	YEAR OF GRADUATION			
Referrals by:	**TOTAL**	**1979**	**1980**	**1981**
Optometrists	1075 49.8%	403 57.6%	349 49.6%	322 42.8%
Ophthalmologists	1250 58.0%	437 62.4%	433 61.5%	379 50.4%
Other M.D.'s	1282 59.4%	460 65.7%	417 59.2%	404 53.7%
Health Professionals	991 45.9%	361 51.6%	344 48.9%	286 38.0%
Non-health Professionals	888 41.2%	324 46.3%	281 39.9%	283 37.6%
None of the Above	286 13.3%	72 10.3%	82 11.6%	132 17.6
Analyzed Respondents	2157 267.6%	700 293.9%	704 270.7%	752 240.1%

of this same data by racial/ethnic groupings was considered inconclusive in view of the relatively small numbers of each racial/ethnic group represented in the population responding.

The survey form also collected data on secondary employment. It was noted that 70.1% of the respondents had no secondary employment. Of the 30.0% reporting a second employment status, the most common were:

- employed by an optometrist (8.9%)
- solo practice (5.0%)
- employed by an optical company (4.3%)

Occupational Mobility

The survey instrument did not directly solicit information on whether the new practitioner changed his/her employment status. We were, however, able to demonstrate change through the use of dates provided to two specific questions regarding first and present employment. The data indicate that 57.6% of graduates of the first cohort group (1979 graduates) had changed positions by the time of the survey. This compares with 48.4% of the 1981 graduates. The survey data suggestesd the hypothesis that graduates enter a first position which is not that which they preferred. The reasons for this apparent behavior may be educational indebtedness, inability to raise needed capital or other possibilities. As a result, many graduates enter a salaried position after graduation. Subsequently they overcome the obstacles to their professional preference and move toward self-employment, which is their professional goal. The data collected in this survey provides some significant support for this hypothesis and suggests fertile ground for additional investigation of the fact that graduates are definitely goal-oriented.

Practice Characteristics

A number of sections of the questionnaire collected data on the type of optometric practice, hours worked, patient load, utilization of paraoptometric personnel and relationships with other health professionals.

Type of Practice

Approximately 90.0% of respondents who are in practice indicate general optometry as their primary type of practice, while another 8.0% reported that their primary practice was in contact lens. No differences in response were noted among the three cohort groups. As a secondary emphasis, 73.7% reported contact lens services while 9.0% indicated general optometry. Also represented in the secondary category was vision training and orthoptics and developmental vision at a level of 5.0%. An analysis of this data by sex and racial/ethnic groups was inconclusive in view of the small numbers in these categories.

Hours Worked

The questionnaire elicited information on the number of hours worked by the respondents. The range of results was extreme in that some reported working 1-10 hours per week and others over 70 hours per week. The most frequent responses, however, were in the 31-40 and 41-50 hour ranges per week (77.3%). Analysis of these data by the type of employment was accomplished as well. There is some indication that those in self-employment mode work slightly more hours per week than those in a salaried position.

Patient Load

In order to determine the work load of the survey population a question on the number of complete vision analyses (CVA) conducted per month was included. It was considered that the concept of CVA was the most useful indicator of clinical work load. The wide range and extremely high numbers reported by many respondents causes us to consider the results unreliable and are therefore not reported.

"New optometry graduates are goal oriented to self employed status rather than being employed by others."

Use of Optometric Assistants

Of the 2,275 respondents, 72.8% reported the use of ancillary optometric personnel. This level is only slightly higher than that reported in a survey conducted by the American Optometric Association.

Relationships with Other Health Professionals

The relationships of optometrists with others in the profession, physicians and other health care practitioners, is considered an indicator of the integration of the optometrist into the health care community. Further, it represents an important factor in the delivery of services and the effectiveness of the practitioner in fulfilling his/her role in the health care system.

The questionnaire utilized a qualitative indicator of these relationships as referral of patients to and referrals of patients from various other health professionals. No quantitative information was obtained. Care is suggested in interpreting the resulting responses. Of the respondents only 1.0% reported that they had made no referrals. On the other hand, 13.3% reported receiving no referrals from other health professionals.

Referrals to other health care sources included 98.0% to ophthalmologists and 86.0% to other M.D.'s. Of those receiving patient referrals, 60.0% were from ophthalmologists and other M.D.'s. While no particular differences exist between the three cohort groups, there is some increase in the referral pattern by the practitioner over time in practice. Tables 6 and 7 summarize the responses on referral patterns.

The referral patterns were also examined by type of practice and difference in the various states. Self-employed optometrists both referred and received referrals at a higher level than those in employed status. The variations of referrals by state were great and a variety of analyses failed to provide any logical explanation for the variances observed.

The opportunity exists to establish this survey as a basis for further follow up of the same respondents in later years to determine changes in practice circumstance and other aspects of their professional career development. ■

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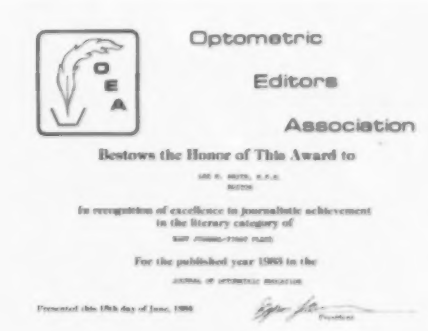
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Part II: Licensure and Practice Establishment Experiences

A Survey of Optometry Graduates to Determine Practice Patterns

Robert L. Bleimann, Ph.D.
Lee W. Smith, M.P.H.

This article is a summary of a two-volume study of optometry graduates conducted by ASCO under a Department of Health and Human Services grant, Contract No. HRA 232-81-0054. Part I of the article, which was written by Lee W. Smith, M.P.H., and included the background to the survey, demographics of the respondents and their practice characteristics, appeared in Volume 10, Number 2/Fall 1984, issue of the Journal of Optometric Education. *Part II was written by Robert L. Bleimann, Ph.D., and includes the analysis of the graduates' licensure and practice establishment experiences.*

Overall Analysis Plan

One of ASCO's objectives was to document the experiences of optometry graduates along the path of obtaining a state license and becoming established in practice. The funding agency had an interest in certain other questions about the impact of state licensure requirements on the entry of graduates into practice, which was narrower in scope than ASCO's objectives. Nevertheless, much of ASCO's analysis plan was concerned with sorting out the complexities of determining impact, which need not be described in this article. The focus of the discussion will be on the empirical indicators that were developed from the survey data.

One aspect that permeated much of the analysis was that of elapsed time, or the acronym ET. The concept referred to an empirical norm about the amount of time required to complete two milestones, or important events, that graduates customarily experience. Examples of a milestone, for instance, would be the awarding of a state license or entry into a professional position. The elapsed time indicator was measured in the study as an interval in months.

ASCO found it necessary to develop a common frame of reference that would link the various sections of the analysis that discuss the passage of graduates through the various licensure and practice establishment milestones. In the survey questionnaire ASCO collected data about five milestones through which graduates commonly traverse. This included the dates for the following events:

- graduation
- state licensure examination for each state undertaken
- notification of licensure results (if successful) for each state undertaken
- first entry into optometric practice and
- entry into current practice.

For each interval between these milestones an indicator of elapsed time (ET) was constructed. Each ET measure thus provided empirical data with which comparisons between individuals were effected.

The following ET measures were deemed to be important for this analysis:

- graduation date —1— date of state licensure examination
- date of state licensure examination —2— date of notification of results
- date of notification of state exam results —3— date of entry into first practice
- date of first entry into practice —4— date of entry into current practice
- graduation date —5— date of notification of state exam results
- graduation date —6— date of entry into first practice
- graduation date —7— date of entry into current practice

NBEO Experience of the Graduates

In the survey, ASCO requested information from the respondents about their pre- and post-graduation experience with the National Boards of Examiners in Optometry (NBEO). One intent of the project was to determine whether the NBEO had a significant impact on the entry of O.D.s into the profession. One measure of impact was whether the candidate's NBEO record was such that he/she was temporarily impeded from obtaining a license in a particular state.

The responses to the questionnaire indicated the following:

- completed the NBEO before graduation—1674 (73.6%)
- either did not take or did not complete the NBEO before graduation—601 (26.4%)

Of the 601 respondents who did not successfully complete the NBEO before graduation, a number went on to complete the NBEO at a later time. The final NBEO status of these respondents was as follows:

- completed the NBEO some time after graduation—92 (15.3%)
- took a part of the NBEO after graduation but did not complete all parts of the Boards—51 (8.5%)
- did not take any part of the NBEO after graduation—416 (69.2%)

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• no answer/incomplete—42 (7.0%)

The overall data from the survey indicated the following:

• 77.6 percent of the graduates successfully completed the NBEO either before or after graduation.

• 18.3 percent of the graduates did not take or complete the NBEO before graduation and did not attempt to complete it.

State Licensure Experience

Analysis of the state licensure experience of the graduates was a complicated undertaking because of the following factors:

• there is considerable variation in the licensure requirements of the various states (ASCO identified six discrete models of the state licensure structure)

• graduates pursue a license-seeking strategy that is unique in that most make a licensure attempt in more than one state

• there is a chronological bias in the licensure structure in that state exams are given at different times of the year and the state of first licensure may not reflect the actual experience of a sizeable number of graduates for whom receipt of a license in their actual state of practice came at a later time

• there is an additional chronological bias in the licensure structure in that there are wide variations in the graduation dates of the schools, exam dates of the states and licensure notification dates of the states.

ASCO's analytical model, which sorts out these complicating factors, is described in greater detail in the Final Report. The discussion here will focus on salient empirical indicators.

The survey requested information from the respondents about whether they attempted to obtain a license in any state and, if so, the dates and outcome of the attempt(s). The results indicated that only 2 of the 2275 respondents did not attempt to obtain a state license. The remaining 2258 respondents attempted to obtain a license in from 1 to 7 states (see Table 1).* Fifteen respondents, who were not included in the 2258 figure, did not provide any information on state licensure, though they were actually practicing. The number of total licensure attempts, both successful and unsuccessful, was 4,743. Not included in this total are 214 multiple attempts by individuals in the same state. Overall, the average number of licensure attempts per respondent was 2.1 attempts. There is no significant variation between any of the different graduation classes from this overall mean. (see Table 1)

One statistic of interest concerned the timing of the state licensure examination and the cumulative total of graduates who attempted a state licensure examination by a certain date. The data indicated that between 94.1-95.9 percent of the gradutes from the three cohorts took their first state exam by the end of August of the year in which they graduated. The comparable figure for a second licensure attempt was 77.7-82.6 percent for the three cohorts. These figures are slightly higher for taking a state exam by the end of the calendar year in which they graduated.

One final statistic of interest concerned the order in which graduates took a state exam in relation to the state in which they end up practicing. The data indicated the following:

Order in which Attempt was Made	% Respondents Who Ended Up Practicing in That State
1st state	65.6%
2nd state	23.3%
3rd state	8.2%
4th state	2.3%
5th state	.4%
6th state	.2%

Empirical indicators for the elapsed time from the date of graduation to the following dates were then developed:

• date of state exam

• date of notification of the results of the state boards.

The data indicated that the mean elapsed time from the date of graduation to the dates of the first through sixth state exam attempts was as follows:

When the data were disaggregated by the month of graduation, it was discovered, not surprisingly, that March graduates waited significantly longer than the May and June graduates to take their first exam.

The next elapsed time interval concerned the time between the state board examination and receipt of notification of results. The overall mean for all individuals who successfully passed the state boards was 1.9 months from the examination date to the notification of results. This figure, however, should be interpreted with caution because, according to the survey, a person who takes an examination in late June and is notified in early August had a two-month wait. The actual figure may vary statistically by one-half month; in the real world by more.

The final elapsed time interval, in essence a combination of the two ET intervals discussed above, concerns the time from graduation to receipt of the results of a state board. This interval is important in the professional development of optometrists because it represents the minimum period they must wait before being able to enter the profession as a fully functioning, licensed practitioner. The overall mean, to receipt of a first license for all months of graduation and states, is 3.98 months. The overall mean from graduation to receipt of a license in the respondent's actual state of practice was 5.2 months. Naturally, this figure decreases with each passing month of graduation.

Not all licensure attempts by the respondents were successful or pursued to completion. Non-success could be a result of a failure on a given portion of the boards, withdrawal of an application, inadequate NBEO scores or other reasons. Overall, 19.3 percent of all respondents indicated they were not successful in one or more licensure attempts. Of these respondents, 79.0 percent were unsuccessful in one exam, 15.7 percent were unsuccessful on two exams, 4.4 percent were unsuccessful on three exams, and less than 1 percent were unsuccessful on a fourth exam. Overall, the most common reasons in-

	First Exam	Second Exam	Third Exam	Fourth Exam	Fifth Exam	Sixth Exam
Mean months (in aggregate)	2.2	5.2	6.9	8.1	11.0	15.0

*Though the survey form only made allowance for up to six states, two respondents indicated seeking a license in a seventh state. For data processing purposes, these additional attempts were not analyzed.

dicated for non-success in the state boards were the following:

- failed written exam —38.4%
- failed practical exam —21.6%
- inadequate NBEO score — 5.3%
- withdrew application — 4.8%
- other — 6.1%
- indeterminate —23.9%

It is interesting to note that, of those individuals who were unsuccessful, just under one-half (49.3 percent) actually went on to successfully complete the state boards in a later attempt.

The survey data were also analyzed from the perspective of the relative distribution of unsuccessful licensure attempts by state. The percentage of unsuccessful attempts ranged from 0.0 percent up to almost 40 percent. Five states, in ascending order, showed a rate of unsuccessful attempts over 25 percent: Nevada, Georgia, Hawaii, Maryland and Mississippi. Fourteen states indicated a rate below 5 percent, of which Arkansas and North Dakota showed no unsuccessful attempts. One observation is that states that do not accept the NBEO for licensure purposes tend to have a higher rate of non-success than those that require the National Boards. However, further investigation on a case-by-case basis is necessary if any additional inferences are to be made from the data.

Entry of Optometry Graduates into the Profession

The previous discussion of the licensure experiences of the respondents indicated that the graduates took an average of 2.1 state board exams. An overwhelming majority of the individuals (88 percent) successfully completed the requirements to practice on their first or second state licensure attempt and ended up practicing in one of these two states. While most state licensure attempts were successful, just over 19 percent of respondents were unsuccessful on their state board exams for a variety of reasons. However, failing a state board exam without seeking to minimize the actual or potential disruption to that individual's professional career does not seem to create a permanent barrier to his/her eventual practice in that state.

This section of the analysis was designed to determine the extent to which the state licensure system affected the entry of the graduates into the profession. An effect was considered "adverse" if one of two outcomes could be attributed directly to non-completion of a state licensure requirement. These outcomes were either (1) outright prohibition of entry into practice in any state or (2) a delay in entry into practice in a state in which practice is intended.

The first outcome refers to losses from the profession in the United States, either "permanent" or "temporary." A loss to the profession was defined as either employment outside the profession or as residency abroad (excluding those in the armed forces). The data indicated that 45 respondents (1.9 percent) indicated they were either not functioning in the profession or were a resident abroad. When this is further broken down into temporary and permanent losses, the figures emerge as follows:

	Number	Percent of Total
• temporary loss—intend to enter the profession at some time	27	1.2%
• permanent loss—foreign resident or no intention of entering the profession	15	0.7%

The conclusion that was derived from these data was that the record of the optometry profession was very good with respect to retaining graduates in the profession.

The second measure of impact, whether differences in state licensure requirements had an impact on the rate at which graduates received a license, involves a very complex discussion of the various models of licensure. Without going into specifics, the data indicated that there is no appreciable difference in the rate at which individuals obtain a state license in their current state of practice between those who passed the NBEO before graduation (5.1 months), and those who did not take or pass the NBEO before graduation (4.9 months). Those individuals, however, who completed the NBEO after graduation had an appreciably longer elapsed time to receipt of their current state license (8.2 months). The data suggest that those who complete the NBEO after graduation do so in order to practice in a particular state that requires the National Boards. It is highly probable that by the time they completed the NBEO, these candidates are out of sync with the state's examination schedule and may have to wait a year until completing the requirements.

The data obtained from the survey indicated a very important finding. For the overwhelming majority of the licensure candidates, the specifics of the state licensure requirements did not account for any significant differences in the mean elapsed time to obtain a license in the respondent's state of practice.

TABLE 1
Number of States in Which a License was Sought, by Cohort

	Total	1979	1980	1981
1 state	819 36.3%	283 38.7%	246 33.6%	290 36.6%
2 states	731 32.4%	230 31.4%	258 35.2%	242 30.6%
3 states	472 20.9%	149 20.4%	150 20.5%	173 21.8%
4 states	157 7.0%	48 6.6%	54 7.4%	55 6.9%
5 states	56 2.5%	16 2.2%	16 2.2%	24 3.0%
6 states	23 1.0%	6 .8%	9 1.2%	8 1.0%
Total	2258	732	733	792

Establishment and Development of an Optometry Practice

The next hurdle optometry graduates face after state licensure is that of establishing themselves in optometric practice or other form of related employment. In the survey, ASCO collected data to permit an analysis of various factors, not related to licensure, on the graduate's experience in entering the profession. These factors included any preparations made for entry into practice while at optometry school and any delays encountered in entering practice. Elapsed time indicators were also developed for those milestones involved with the graduate's entry into a first position and current position.

Within the profession there is a concern about the type and extent of the preparations optometry students make for their eventual entry into the profession. These prior preparations might include obtaining a service-related scholarship, working in an optometry or vision care related office and the like. ASCO identified a number of activities that would most commonly be undertaken by graduates and listed them in the survey. Respondents were asked to check all that applied.

Overall, 95.6 percent of the respondents indicated that they made one or more preparations for entry into practice. Almost three-quarters (74.1%) mentioned that they had talked to a prospective employer, partner or associate. The second most common form of preparation indicated was taking a practice management course at a school of optometry (66.6%). This finding was expected because most of the schools of optometry require their students to take such a course, usually in the spring term of the fourth year. While the usefulness of the practice management courses was questioned by a number of respondents in the questionnaire form, the fact that these courses are frequently taken showed that many graduates have at least a minimum degree of preparation for dealing with professional problems after graduation. Working in an optometry office ranked third (42.0%) in the list of prior preparations. The most common arrangements for these students were working part-time under the supervision of an optometrist for a salary or full-time as part of an externship program organized by the school. Closely following in fourth place was the category of negotiating a position to commence upon graduation (41.7%). This preparation differs from talking to prospective employers in that some form of arrangement is suggested or implied. The remaining categories, in descending order, include selecting an actual practice location, devising a marketing strategy, ordering equipment, developing a relationship with another health professional for joint services, and "other" preparations.

'In the first 12-15 months after graduation between 93.9 and 95.9 percent of the graduates had entered their first practice.

Difficulty in finding employment after graduation was mentioned by 23.6 percent of the respondents. It is difficult to analyze this response any further because the nature of the problem has not been specified. The other professional delays mentioned, in descending order, were problems of finding a suitable practice location (14.6%), delays in the receipt of the necessary equipoment (3.7%), and that a business license to practice was not readily available (0.9%).

In contrast to those individuals who reported having some difficulty in entering practice after graduation, 30.7 percent of the respondents indicated that they did not encounter any major problems in establishing a practice.

A number of observations can be made about the experiences of men and women with regard to lag factors. Overall, women report having encountered more difficulty finding employment than men (29.9% to 22.4%, respectively). Women also reported having problems financing a practice as a result of educational indebtedness more frequently than men (39.4% to 34.3%, respectively). However, in each of the other professional lag factors men were more likely than women to check one of these categories. When delays caused by personal decisions are examined, women were more likely than men to indicate such a lag.

Another section of the report dealt with the elapsed time from the receipt of a state license to entry into professional practice. The data indicate that by the end of the calendar year in which the respondent graduated, between 86.9 and 89.1 percent of the graduates for each of the three years had entered their first practice circumstance. Moreover, in the first 12-15 months after graduation between 93.9 and 95.9 percent of the graduates had entered their first practice.

Additional data are also presented on month of entry into current practice. The data indicate that the rate of entry into the respondent's position increases for each later cohort. These data suggest that the newer graduates have not had the same opportunity or inclination to change positions as the earlier graduates. In other words, fewer 1980 and even fewer still 1979 graduates indicated having entered their current, as opposed to their first, practice in the two years following graduation.

Another analyzed elapsed time indicator was the interval from receipt of a first state license to first entry into practice. The overall mean is 2.56 months. This mean may not be the actual mean for many graduates because the first state of licensure was not necessarily the state in which the graduate entered his/her first practice. Overall, 25.3 percent of graduates entered practice the same month when their first state license was received. By month six the cumulative percentage was 89.0 percent of all respondents. The data for each of the cohorts showed no significant differences.

When the figures on prior preparations are broken down into categories by gender, a few interesting observations emerge. By and large, a higher percentage of males than females indicated undertaking one or more types of prior preparations specified in the questionnaire. However, females outscored males in two areas: working in an optometry office (53.7% female—39.7% male) and developing a joint service relationship (8.5% female—7.4% male). It is not clear why women work in an optometry office in proportionately greater numbers than men. One possible explanation is that women purportedly favor working in a joint practice or salaried position rather than in a solo practice after graduation. Whether this occurs by design or by circumstance is

unclear but this supposition is verified by the data on the form of practice by sex. Indeed, women work less in a self-employed capacity, which might explain the greater incidence of prior preparations undertaken by men if self employment was their preferred professional goal. This interpretation is underscored by the fact that the difference between men and women in the categories of talking to prospective employers, etc., and negotiating a position is almost negligible, but more pronounced with respect to selecting a practice location, devising a marketing strategy and ordering equipment. A fruitful idea for further study would be to examine whether men and women pursue the same or different professional goals in optometry, the types of preparations they undertake to effect their entry and the effectiveness of these preparations.

In the survey, ASCO was also concerned about any lag factors encountered after graduation that had a significant impact on the entry of graduates into practice. Anecdotal evidence from some graduates suggested that the indebtedness of many new O.D.s was a serious obstacle to the achievement of a self-employed practice in the profession. This question was designed to obtain information about the professional and personal factors that were thought most likely to have an impact on the post-graduation experiences of the O.D.s. In interpreting the data, however, one must be aware that there were certain design flaws that limit the usefulness of the results.

Overall, the most frequent response (35.1%) involved acknowledgement of a large debt incurred by educational expenses that caused difficulties in financing a practice. The next most frequently cited problem (25.2%) was a difficulty in obtaining the necessary capital to finance a practice. These findings support some of the impressions ASCO has gathered from recent graduates that the financing of a practice, when combined with prior existing debt, has made the attainment of a self-employed status more difficult in recent years. While this question does not provide any means to quantify this assertion, it suggests that the anecdotal evidence has a basis in fact.

The next ET interval examined the time between entry into first practice and entry into current practice. The reader should be made aware that ASCO assumed that establishment of a practice is a developmental process in which one would expect to see major differences in levels of professional attainment between the cohort groups. The data suggest that this hypothesis is indeed true. The overall mean time from first practice to current practice was 6.31 months. More important, however, were the mean times for each of the three graduation classes. The figures for each graduation year were as follows:

Graduation Year	ET From First Practice to Current Practice
1979	9.16 months
1980	6.27 months
1981	3.69 months

It is not uncommon for a new O.D. to enter into a supervised position, fulfill a state residency requirement or take a number of part-time positions immediately after graduation. A consolidation process often takes place in which the graduate moves on to a full-time capacity. The data for the 1981 cohort suggest that these graduates have made the first of perhaps a number of professional moves that ultimately lead to their career goal. The lengthened ET indicator for the 1980 and 1979 cohorts, respectively, suggests that later employment changes can be expected from the 1981 graduates as they proceed toward their professional goal.

The final ET indicator we will discuss concerns the very important interval from the month of graduation to entry into the respondent's current practice. Overall, the mean ET for all years was 10.3 months. The cohort data yield variable experiences for each of the graduating years. The mean for 1979 graduates is 13.3 months, 10.4 months in 1980 and 7.5 months in 1981. □

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An Analysis of Pharmacology Training in Schools of Optometry, Medicine and Dentistry

Marti Waigandt, B.S.
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Introduction

In recent years, a great deal of controversy has existed over the issue of drug licensure for optometrists. Members of the medical community have come out on both sides of the issue, some stating that optometrists are neither qualified to use nor require pharmaceuticals in practice and others stating that pharmaceuticals are both necessary and important in optometric practice.[1,2,3]

The role of the optometrist has changed markedly from the mid-19th century entrepreneur who merely corrected refractive errors to the highly skilled professional licensed to examine, diagnose and treat conditions of the visual system.[4,5] In addition to correcting refractive errors, the optometrist can often recognize early stages of pathological conditions such as diabetes, hypertension, arteriosclerosis, cataracts and glaucoma.[6] Since many of these conditions are asymptomatic at the onset, it is of vital importance that optometrists serve as portals of entry and make referral to the appropriate health care provider.[7] Optometrists refer 5.6 percent of their patients each week.[8] Improved and more complete ocular and visual care would undoubtedly be accomplished with the use of pharmaceutical agents. This would result in increased benefits and service to the patient. With the use of these agents, the training and skills of the optometrist would be maximized.

Not only has the role of the optometrist expanded, but so has the public need for his services. In the United States, approximately two out of every five persons require eye care, most of which is provided by optometrists.[9] Approximately 19,300 optometrists currently provide eye and vision service to 69 percent of the counties in the United States. About 9,500 active ophthalmologists provide service in only 33 percent of the counties in the U.S. and they are concentrated primarily in metropolitan areas.[10] Therefore, where a large proportion of the population has no access to an ophthalmologist they may have access to an optometrist.[11] It is important that every adjunct to diagnosis, including pharmaceutical agents, be made available to the optometrist in order to serve the public.

With regard to the diagnostic agents utilized by optometrists, the risks of adverse drug reactions are minimal. The safety and efficacy of these drugs has been established and substantiated in the professional literature.[12,13,14] One study showed that, for an 85 year period, "possibly ten deaths were reported associated with the topical application of these drugs, but only when misused."[15] Additionally, use of diagnostic pharmaceutical agents by optometrists in England, the United States Armed Services and in over thirty states in which use of these drugs is allowed has not resulted in any incidence harmful to the welfare of the public.[16]

The public need for optometrists to use drugs has been stated and the safety of these drugs has been demonstrated. Therefore, the question is: Are optometrists qualified to use pharmaceuticals? It is the intent of this study to analyze optometrists in terms of academic qualifications as compared to clinicians currently licensed to use pharmaceuticals.

Methods

Fourteen states contain colleges of optometry: Alabama, California, Illinois, Indiana, Massachusetts, Michigan, Missouri, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee and Texas. These states were designated as study states and collectively contain 111 colleges of medicine, dentistry and optometry. Of these school types, 37 colleges of medicine, 31 colleges of dentistry and 15 colleges of optometry were selected for participation in the study. The department chairperson or director of pharmacology in each school was identified as the study respondent.

Data were generated from the subjects' responses to an instrument whose purpose was to query the amount of hours devoted to the study of pharmacology. The investigation, being descriptive in nature[17] viewed hours spent in each of 13 major pharmacology study categories and total class hours in the study of pharmacology as separate dependent variables. These categories included: (1) basic principles in pharmacology, (2) drug effects on the nervous

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system, (3) psychopharmacology, (4) central nervous system stimulants and depressants, (5) anesthetics, (6) cardiovascular agents, (7) ocular pharmacology, (8) respiratory and gastrointestinal tract agents, (9) endocrine pharmacology, (10) chemotherapy, (11) poisons and antidotes, (12) drug interactions and (13) prescription writing. A 14th variable involved the total hours each school type spends on the study of pharmacology. This instrument was designed through a review of the literature[18] and with the consultation of experts in the field; and, indicative of a pharmacology education sequence for health practitioners.

Results from the instrument were analyzed using the statistical package for the social sciences (SPSS) and calculated on an AS 9000 computer system at a major university. Treatment of the data was performed implementing: (1) descriptive tables utilized to analyze the demographic data, (2) means, standard deviations and analysis of variance (ANOVA) to analyze the major pharmacology study categories and (3) comparative analyses on the major pharmacology study categories whose F-ratio indicated significant differences. The .01 level was selected for statistical significance.

Results

Of the 83 schools surveyed, 41 schools responded (49.4 percent response rate overall). (Note: Several schools responded after the study deadline of May 1, 1984, but those data are not reflected in these results.) Eight were schools of optometry (53.3 percent response rate), 19 were schools of medicine (51.3 percent response rate) and 14 were schools of dentistry (45.2 percent response rate). Table 1 presents the states surveyed and the schools whose responses are reflected in the research data. With only one exception (Massachusetts), every state is represented by at least one school type and five states are represented by all school types studied.

TABLE 1
States surveyed and schools reflected in the research data

State	School Type	Number of Schools Responding
Alabama	Optometry	1
	Medical	2
	Dental	1
California	Optometry	2
	Medical	3
	Dental	1
Illinois	Optometry	1
	Medical	2
	Dental	1
Indiana	Optometry	1
	Medical	1
	Dental	0
Massachusetts	Optometry	0
	Medical	0
	Dental	0
Michigan	Optometry	0
	Medical	1
	Dental	1
Missouri	Optometry	1
	Medical	0
	Dental	0
New York	Optometri	0
	Medical	2
	Dental	1
Ohio	Optometry	1
	Medical	2
	Dental	2
Oklahoma	Optometry	0
	Medical	1
	Dental	1
Oregon	Optometry	0
	Medical	0
	Dental	1
Pennsylvania	Optometry	0
	Medical	2
	Dental	3
Tennessee	Optometry	0
	Medical	2
	Dental	0
Texas	Optometry	1
	Medical	1
	Dental	2
TOTAL		41

The results of the pharmacology study questionnaire in terms of mean responses and statistical comparisons between the study groups in each of the 14 categories are presented in Tables 2, 3 and Figure 1. Table 2 presents means, standard deviations and analysis of variance of classroom hours spent on major pharmacological study categories for the school types. Table 3 shows the comparisons between school type for major pharmacology study category whose F-ratio indicates significant differences. Figure 1 illustrates the total class hours in pharmacology training for schools of optometry, medicine and dentistry.

Basic Principles in Pharmacology

The range of hours in category 1 of the instrument is 15. Four schools spend only three hours and two spend 18 hours on this category. The overall mean for the entire sample is 8.71 hours. An F-ratio of 5.48 shows that there are significant differences among the three school types in hours spent in this study category.

Schools of optometry are not significantly different than either schools of medicine ($t = 2.51$, $df = 16.2$, $p = .02$) or schools of dentistry ($t = 0.04$, $df = 14.3$, $p = .97$). Medical schools do, however, spend more hours on this category than schools of dentistry ($t = 3.01$, $df = 30.8$, $p = .005$).

Drug Effects on the Nervous System

The second category for comparison within the pharmacology study instrument involves class hours spent studying drug effects on the nervous system. The range of hours was found to be 23 with two schools spending only five hours and one school spending 28 hours on this category.

The mean is 13.24 overall and an F-ratio of 8.61 showed that there are significant differences among the three school types on this category of the instrument. Comparatively, optometrists and dentists do not differ on this category ($t = 0.99$, $df = 13.1$, $p = .922$), whereas medical schools devote more hours than either optometry ($t = 2.97$, $df = 14.8$, $p = .009$) or dental schools ($t = 3.83$, $df = 30.9$, $p = .001$).

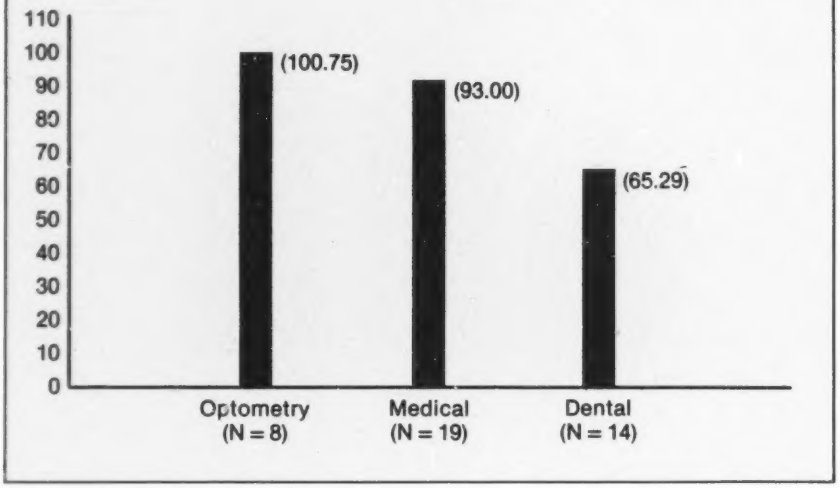
Psychopharmacology

The range for hours spent teaching psychopharmacology is 10. The grand mean for this category is 4.75 with the three school types averaging between four and six class hours. According to the calculations, there are no significant differences ($F = 1.74$, $p = .189$/n.s.) among optometry schools ($\bar{X} = 4.37$, $SD = 3.25$), schools of medicine ($\bar{X} = 5.47$, $SD = 2.24$) and schools of dentistry ($\bar{X} = 4.00$, $SD = 1.80$).

Central Nervous System Depressants and Stimulants

The fourth category within the questionnaire involves classroom hours spent on the CNS depressants and stimulants. No significant differences are present among schools of optometry, medicine and dentistry for hours spent in this content area ($F = 1.02$, $p = .368$/n.s.). The three school types average between seven and ten class hours on the CNS depressants and stimulants.

FIGURE 1
Total Class Hours in Pharmacology Training for Schools of Optometry, Medicine and Dentistry



Anesthetics

The hourly range on the instrument category identified as anesthetics is 10. The overall mean for the entire sample is 4.63. Although schools of optometry and medicine are not significantly different in this category ($t = 1.56$, $df = 21.0$, $p = .133$), an F-ratio of 6.91 indicates that significant differences do exist among the three groups. The comparisons between schools on hours spent teaching anesthetics show that schools of optometry require significantly less hours than schools of dentistry ($t = 3.80$, $df = 18.9$, $p = .001$).

Cardiovascular Agents

Category six within the pharmacology study questionnaire deals with cardiovascular agents. An F-ratio of 14.31 shows that significant differences exist among the school types on this category. According to the analysis, optometry schools and schools of dentistry do not differ on this category ($t = 1.24$, $df = 19.8$, $p = .229$). The mean hours for schools of medicine ($\bar{X} = 12.26$) fall above the grand mean of 9.49 and indicate that medical schools spend more time on cardiovascular agents than dental schools and schools of optometry (Med vs Den, $t = 3.74$, $df = 23.8$, $p = .001$; Med vs Opt, $t = 6.41$, $df = 20.7$, $p = .000$).

Ocular Pharmacology

The seventh category within the instrument asks for classroom hours spent on ocular pharmacology. The overall mean hours spent by the sample schools is 7.12. According to the data, schools of optometry average ($\bar{X} = 34.00$) more than the grand mean whereas medical and dental schools spend less time than the overall average ($\bar{X} = 0.63$ and 0.57 respectively). All three groups had relatively large standard deviations that indicate extensive variability.

The results of the analysis of variance (ANOVA) show that there are statistically significant differences among the groups on this category of the pharmacology study questionnaire. The comparative analyses show that optometry schools spend more hours than schools of medicine ($t = 8.97$, $df = 7.0$, $p = .000$) and schools of dentistry ($t = 8.94$, $df = 7.0$, $p = .000$) teaching ocular pharmacology to their students.

TABLE 2
Means, Standard Deviations and Analysis of Variance of Class Lecture Hours Spent on Major Pharmacological Study Categories by Optometry, Medical and Dental Schools

Category	Optometry N = 8 $\bar{X}$ (SD)	Medical N = 19 $\bar{X}$ (SD)	Dental N = 14 $\bar{X}$ (SD)	Grand Mean (SD)	F-ratio	F
Basic Principles in Pharmacology	7.12 (3.04)	10.58 (3.75)	7.07 (2.95)	8.71 (3.36)	5.48	*
Drug Effects on Nervous System	10.75 (4.23)	16.26 (4.76)	10.57 (3.71)	13.24 (4.33)	8.61	**
Psycho-pharmacology	4.37 (3.25)	5.47 (2.24)	4.00 (1.80)	4.75 (2.37)	1.74	n.s.
CNS Stimulants and Depressants	7.75 (3.72)	9.89 (4.21)	8.57 (3.20)	9.02 (3.84)	1.02	n.s.
Anesthetics	3.12 (1.13)	4.05 (1.93)	6.29 (2.73)	4.63 (2.13)	6.91	*
Cardiovascular Agents	6.12 (1.88)	12.26 (2.99)	7.64 (3.83)	9.49 (3.15)	14.31	***
Ocular Pharmacology	34.00 (10.57)	0.63 (0.89)	0.57 (0.65)	7.12 (4.59)	170.14	***
Respiratory and GI Tract Agents	2.00 (1.77)	3.26 (1.66)	2.29 (2.02)	2.68 (1.85)	1.88	n.s.
Endocrine Pharmacology	5.50 (2.83)	7.11 (3.40)	4.14 (2.51)	5.78 (3.23)	3.93	n.s.
Chemotherapy	8.37 (4.75)	14.05 (5.50)	8.64 (4.24)	11.10 (4.96)	6.28	*
Poisons and Antidotes	1.00 (1.07)	3.31 (2.56)	1.35 (1.22)	2.19 (1.96)	5.90	*
Drug Interactions	1.50 (0.93)	1.47 (0.70)	1.71 (0.99)	1.56 (0.84)	0.35	n.s.
Prescription Writing	1.12 (0.64)	1.11 (0.87)	1.64 (1.15)	1.29 (0.95)	1.46	n.s.
Total Hours in Pharmacology	100.75 (14.24)	93.00 (15.47)	65.29 (19.40)	85.05 (16.71)	15.46	***

*p <.01 **p < .001 ***p < .0001

Respiratory and Gastrointestinal Tract Agents

An analysis of variance (ANOVA) conducted on responses to category eight of the instrument indicate that optometry, medical and dental schools are not significantly different (F = 1.88, p = .166/n.s.) in terms of hours spent teaching respiratory and GI tract agents. The overall mean, in terms of hours, is 2.68 and the schools devote an average of two to four hours on this category.

Endocrine Pharmacology

The ninth category within the pharmacology study questionnaire deals with hours spent teaching endocrine pharmacology. An F-ratio of 3.93 (p = .028/n.s.) indicates that no significant differences exist among the school types in terms of hours devoted to this category. All three school types are close to the grand mean of 5.78 class hours.

Chemotherapy

The range of hours the school types spend teaching chemotherapy is 30. Over 40 percent of the schools studied

TABLE 3
Comparisons Between School Type for Significant Differences ($p < .01$) on Major Pharmacology Study Category

		t-ratio	df	t Probability
Basic Principles in Pharmacology	Optometry and Medical	2.51	16.2	.023
	Optometry and Dental	0.04	14.3	.969
	Medical and Dental	3.01	30.8	.005*
Drug Effects on the Nervous System	Optometry and Medical	2.97	14.8	.009*
	Optometry and Dental	0.10	13.1	.922
	Medical and Dental	3.86	30.9	.001*
Anesthetics	Optometry and Medical	1.56	21.9	.133
	Optometry and Dental	3.80	18.9	.001*
	Medical and Dental	2.62	22.2	.016
Cardiovascular Agents	Optometry and Medical	6.41	20.7	.000*
	Optometry and Dental	1.24	19.8	.229
	Medical and Dental	3.74	23.8	.001*
Ocular Agents	Optometry and Medical	8.97	7.0	.000*
	Optometry and Dental	8.94	7.0	.000*
	Medical and Dental	0.22	31.0	.820
Chemotherapy	Optometry and Medical	2.70	15.3	.020
	Optometry and Dental	0.13	15.3	.890
	Medical and Dental	3.19	30.9	.003*
Poisons and Antidotes	Optometry and Medical	3.31	25.0	.003*
	Optometry and Dental	0.77	16.4	.480
	Medical and Dental	2.92	27.2	.007*
Total Lecture Hours in Pharmacology	Optometry and Medical	1.26	14.3	.230
	Optometry and Dental	4.90	18.5	.000*
	Medical and Dental	4.41	24.2	.000*

*$p < .01$

spend 10 hours or less on this category while only five percent spend more than 20 hours. The grand mean for this category is 11.10 hours. The ANOVA indicates that significant differences ($F = 6.28$) exist among the school type in terms of hours spent teaching chemotherapy.

Optometry schools are not significantly different than medical schools ($t = 2.70$, $df = 15.3$, $p = .02$) or schools of dentistry ($t = 0.13$, $df = 15.3$, $p = .89$). Dental and medical schools are significantly different ($t = 3.19$, $df = 30.9$, $p = .003$), however, with medical schools spending more time on chemotherapy than dental schools.

Poisons and Antidotes

Category eleven within the pharmacology study questionnaire asks for the number of hours the school types spend on poisons and antidotes. An F-ratio of 5.90 indicates that there are significant differences among the school types on this category. A comparative analysis between school type shows that medical schools spend more time than schools of optometry and dentistry (Med vs Opt, $t = 3.31$, $df = 25.0$, $p = .003$; Med vs Den, $t = 2.92$, $df = 27.2$, $p = .007$) but that optometry and dental schools do not differ on hours spent teaching poisons and antidotes ($t = .88$, $df = 16.4$, $p = .48$).

Drug Interactions

The overall mean within school types for this category of the instrument is 1.56 hours. All three school types average approximately one and a half hours teaching drug interactions. An analysis of variance ($F = 0.35$, $p = .71$/n.s.) conducted on this category indicates that schools of optometry, dentistry and medicine are not significantly different in terms of hours spent on category twelve.

Prescription Writing

The thirteenth category within the pharmacology study questionnaire involves responses relating to hours spent on prescription writing. No significant differences are found among the school types ($F = 1.46$, $p = .24$/n.s.) with all three school types devoting approximately one hour on this category.

Total Hours in Pharmacology

The last category for comparison within the pharmacology study questionnaire deals with the total classroom hours the school types spend studying pharmacology. The range of hours is 88. Of the schools surveyed, one school

spends only 39 hours teaching pharmacology whereas another spends 127. The overall average within the school types is 85.05 hours. Figure 1 shows a graphic comparison for total class hours in pharmacology training for schools of optometry ($\bar{X} = 100.75$), medicine ($\bar{X} = 93.00$) and dentistry ($\bar{X} = 65.29$).

An analysis of variance indicates that significant differences exist among the groups for total hours spent teaching pharmacology. Comparisons between schools show that no significant differences exist between optometry and medical schools ($t = 1.26$, $df = 14.3$, $p = .23$). This is consistent with what Hegeman found when she compared the pharmacology content for optometry and medical students at Indiana University, Bloomington.[19] Both schools of optometry and medicine devote more total class hours than schools of dentistry to the study of pharmacology (Opt vs Den, $t = 4.90$, $df = 18.5$, $p = .000$; Med vs Den, $t = 4.41$, $df = 24.2$, $p = .000$).

Conclusions

The safety of the pharmaceuticals in question and the need for optometrists to use such agents has been established. In the opinion of some members of the medical community, optometrists are not properly educated in the area of pharmacology, thus unqualified to utilize pharmaceuticals. However, there is no justification for this belief on the basis of the data presented. Some ophthalmologists are presumptuous enough to believe that they are the only persons qualified to conduct comprehensive eye examinations.[20] This may be due to their lack of knowledge regarding academic training for optometrists.

Based upon the results of this study, optometrists receive sufficient training in the area of pharmacology. In no category were optometrists significantly lower than both medicine and dentistry. This indicates that optometry offers at least as much training in any study area as one of the other two health professions.

The significant differences present among the groups can be attributed to the professional requirements. Ocular pharmacology is emphasized for optometry while dentistry spends more time studying anesthetics and medicine, concentrates on cardiovascular agents, drug effects on the nervous system and poisons and antidotes. Therefore, all optometrists should be permitted to utilize ocular pharmaceutical agents in order to provide the maximum benefit and service to the public. □

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The institutional affiliation of Dr. Rogers Reading was incorrectly identified on page 23 of the Summer 1984 (Volume 10, Number 1) issue of JOE. Dr. Reading is a long-time and respected faculty member at Indiana University School of Optometry. JOE regrets the error.

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Annual Survey of Optometric Educational Institutions

1983-84

The following is a summary of portions of the 1983-84 Annual Survey of Optometric Educational Institutions conducted by the American Optometric Association Council on Optometric Education. The accompanying tables highlight information on student enrollment, academic achievement, financial aid and student expenditures for the year 1983-84. This report is published as an annual feature of JOE.

Student Enrollment

Total student enrollment for the academic year 1983-84 was 4,539; this represented a decrease of less than 1% (.54%) over the previous year's enrollment of 4,561. First-year students totaled 1,187; this represented an increase of 5.9% from the previous year's 1,120.

Female enrollment increased by 10.05% from 1,173 students in 1982-83 to 1,291 students in 1983-84 and women represented more than one-fourth (28.4%) of the total enrollment. The number of women in the 1983-84 entering class comprised 34.2% (406 students) compared to 29.3% (328 students) in 1982-83; this represented an increase of 23.8%.

Minority enrollment accounted for 12.87% (584 students) of the student body in 1983-84 compared to 12.17% (555 students) in 1982-83; this represented an increase of 5.2% over the previous year. This year's increase in minority enrollment indicated a continuing climb in the percentage of minority enrolled in the schools and colleges of optometry over the past five years. Minority enrollment represented 8.07% of the total student body in 1978-79, 8.78% in 1979-80, 9.52% in 1980-81, 10.66% in 1981-82, 12.17% in 1982-83 and 12.87% in 1983-84.

Women accounted for 37.3% (218 students) of minorities enrolled in 1983-84, compared to 37.8% in 1982-83. Of minorities enrolled, 50.2% were Asian American, 21.1% Spanish surname, 15% Black American, 10.6% foreign national and 3.1% native American Indian.

Academic Achievement

More than two-thirds of the entering class in 1983-84, 66.4% (775 students), had four or more years of prior college work before entering optometry school. In addition, the majority of this class, 60.7% or 709 students, had a baccalaureate or higher degree, whereas only 5.6% or 66 students were reported having 4+ years of prior college work. The number of entering students having four or more years of college represented an increase of 4.3% from the 1982-83 total of 743 students (67.4% of the entering class); also the number of students having a baccalaureate or higher degree increased by 4.1% from 1982-83's total of 681 students. It should be noted, however, that the total number of students reported in this table also showed an increase of 6%.

Of the remaining first year students, 9% had 2+ years of prior college work, and 24.7% had 3+ years.

The mean grade point average for entering students in 1983-84 was 3.16, declining from 3.17 in 1982-83. Fourteen of the sixteen U.S. optometric educational institutions had mean grade point averages of 3.0 or better, and four of these institutions had mean grade point averages of 3.25 or better. These grade point averages were based on a total of 1,190 entering students reported in *Information for Applicants to Schools and Colleges of Optometry*, Fall, 1985, published by the American Optometric Association in cooperation with the Association of Schools and Colleges of Optometry.*

Financial Aid

The amount of aid granted through institutions other than loans** for the academic year 1983-84 is given in percentages for fifteen of the U.S. institutions. Also, the amount of student loans granted through institutions for 1983-84 is given in the same manner. These show the percentage of students receiving aid in each of the four classes, percentage of average aid and the percentage from federal and state sources. These amounts previously were reported in dollars on past surveys; therefore, it is impossible to make any comparisons between years or to determine any increases or decreases in amounts, types or sources of aid for the academic year 1982-83.

Student Expenditures

Annual student expenditures for tuition, fees, books, supplies and other costs excluding living expenses ranged from $1,850 to $8,008 for residents and $2,180 to $12,470 for non-residents in 1983-84. The mean average expenditure for costs other than room and board was $4,669 for residents and $8,154 for non-residents. These figures represented a decrease of .80% for residents and an increase of 2.43% for non-residents over the 1982-83 mean costs of $4,707 and $7,960 respectively.***

The average expenditures for room and board in 1983-84 ranged from $2,312 to $5,571. The mean average expenditure was $3,521; this represented an increase of 7% over the previous year's $3,291.

Taken altogether, the mean average cost of education for an optometry student in 1983-84 totaled $8,190 for residents and $11,675 for non-residents. These figures represented increases of 2.4% and 3.76%, respectively, over the costs of $7,998 and $11,251 in 1982-83.***

**Information for Applicants to Schools and Colleges of Optometry*, Fall, 1984, St. Louis, Missouri: American Optometric Association.

****Includes scholarships, fellowships, grants in aid, etc.**

******1982-83 mean costs for residents and non-residents were adjusted downward to reflect the corrected SUNY figures that appeared in Volume 10, Number 1 issue of JOE.**

The following abbreviations have been used in the accompanying tables.

Schools

FSC — Ferris State College
IAU — InterAmerican University of Puerto Rico
ICO — Illinois College of Optometry
IU — Indiana University
NECO — New England College of Optometry
NSU — Northeastern State University
PU — Pacific University
PCO — Pennsylvania College of Optometry
SCCO — Southern California College of Optometry
SCO — Southern College of Optometry
SUNY — State University of New York
TOSU — The Ohio State University
UAB — University of Alabama in Birmingham
UCB — University of California, Berkeley
UH — University of Houston
UMSL — University of Missouri-St. Louis

Profile of 1983 Entering Class

Grade Point Averages (4.0 Scale)

	High	Low	Mean	Number of Students
FSC	3.85	2.83	3.34	32
IAU	3.72	2.20	2.96	32
ICO	3.84	2.50	3.02	141
IU	N/A	N/A	3.40	60
NECO	3.77	2.17	3.02	86
NESU	3.67	2.63	3.16	24
PCO	3.90	2.50	3.02	157
PU	4.00	2.26	3.07	88
SCCO	4.00	2.75	3.23	97
SCO	3.82	2.05	2.91	110
SUNY	4.00	2.50	3.22	63
TOSU	3.98	2.75	3.35	60
UAB	3.86	2.64	3.29	40
UCB	4.00	2.20	3.22	68
UMSL	3.94	2.61	3.23	100
UH	3.90	2.10	3.20	32
Total				

SOURCE: *Information for Applicants to Schools and Colleges of Optometry. Fall, 1985. St. Louis, Mo: American Optometric Association.* *N/A—Not Available*

1983-84 Annual Survey of Optometric Educational Institutions

Number of First Year Students Enrolled with:

	2+ Yrs.	3+ Yrs.	4+ Yrs.	B.A., B.S.	M.A., M.S.	Ph.D.	TOTAL
FSC	13	6	8	4	0	0	31
ICO	24	42	4	69	2	0	141
IU	13	22	6	18	1	0	60
NECO	0	0	11	75	0	10	96
NSU	4	9	4	6	1	0	24
PCO	0	40	0	113	4	0	157
PU	15	13	6	51	3	0	88
SCCO	1	19	16	58	2	1	97
SCO	18	30	5	55	2	0	110
SUNY	0	6	0	53	3	1	63
TOSU	25	12	3	20	0	0	60
UAB	0	6	2	30	2	0	40
UCB	0	32	2	32	2	0	68
UH	0	25	4	67	3	1	100
UMSL	0	7	1	23	1	0	32
U.S. TOTALS	105	288	66	670	26	13	1167

1983-84 Annual Survey of Optometric Educational Institutions

	Financial Aid Granted Through Institutions Excluding Loans							Student Loans Granted through Institutions					
	Percentage of Students Receiving Aid					From	From	Percentage of Students Receiving Loans					
	1st Year	2nd Year	3rd Year	4th Year	Average	Federal	State	1st Year	2nd Year	3rd Year	4th Year	Average	Federal
FSC	44	50	19	3	29	37	63	74	56	87	81	74	44
ICO	14	17	15	40	22	59	19	79	85	89	85	84	99
IU	8	11	7	2	7	0	2	33	33	36	28	32	95
NECO	46	40	52	43	45	37	51	83	87	77	66	78	100
NSU	45	70	30	25	42	65	30	75	65	73	60	68	25
PCO	10	5	5	5	6	25	25	85	85	85	85	85	99
PU	10	8	12	14	11	7	88	18	18	20	20	19	100
SCCO	24	33	40	50	37	1	99	76	88	85	82	83	100
SCO	0	0	0	0	0	n a	n a	21	43	43	30	35	90
SUNY	60	62	60	48	58	30	51	98	98	98	98	98	98
TOSU	21	40	28	17	26	0	6	19	42	43	24	32	92
UAB	15	8	10	3	9	0	68	65	78	88	60	73	99
UCB	6	7	4	5	6	0	46	33	35	42	23	33	89
UH	unk	30	17	22	unk	unk	unk	unk	56	52	58	unk	unk
UMSL	12	12	13	n a	12	unk	unk	68	88	90	n a	82	92

1983-84 Annual Survey of Optometric Educational Institutions
Annual Student Expenditures

	Resident Educational Expenditures					Non-Resident Educational Expenditures					Average Room & Board Expenditures
	1st Year	2nd Year	3rd Year	4th Year	Average	1st Year	2nd Year	3rd Year	4th Year	Average	
FSC	$6.949	$6.200	$6.498	$7.108	$6.689						$2.312
ICO						8.991	8.571	8.171	9.216	8.737	3.480
IU	4.314	7.132	5.789	3.768	5.251	6.139	9.157	7.915	5.293	7.126	2.715
NECO						9.890	9.585	9.658	7.270	9.101	5.571
NSU	3.320	2.488	2.633	1.890	2.583						3.562
PCO	7.955	7.240	6.555	5.990	6.935	11.955	11.240	10.555	9.990	10.935	3.904
PU						10.270	8.970	8.670	8.320	9.057	2.370
SCCO						8.081	8.164	7.108	6.641	7.498	3.746
SCO	7.810	8.008	8.070	4.720	7.152	12.210	12.408	12.470	9.120	11.552	4.296
SUNY	7.120	6.620	6.120	5.620	6.370	9.800	9.300	8.800	8.300	9.050	4.500
TOSU	3.846	3.873	3.921	3.501	3.785	8.346	8.376	8.451	8.001	8.293	4.221
UAB	3.113	3.590	4.120	2.379	3.301	4.313	4.790	5.320	3.579	4.501	2.682
UCB	2.850	1.850	2.300	1.850	2.213	6.210	5.210	5.660	5.210	5.573	3.327
UH	4.150	1.934	1.323	1.180	2.147	5.150	2.934	2.323	2.180	3.147	3.691
UMSL	5.107	4.613	5.691	4.338	4.937	11.607	11.113	12.191	10.838	11.437	2.438

1983-84 Annual Survey of Optometric Educational Institutions

Full-Time Students Enrolled in the Professional Degree Program

	First Year		Second Year		Third Year		Fourth Year		TOTALS		
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total
FSC	21	10	23	5	24	6	26	4	94	25	119
ICO	97	44	87	23	105	26	127	22	416	115	531
IU	44	17	41	24	39	26	45	23	169	90	259
NECO	60	36	56	19	62	29	61	31	239	115	354
NSU	21	3	19	6	20	3	18	4	78	16	94
PCO	94	68	93	42	101	37	111	38	399	185	584
PU	77	11	65	18	72	11	67	18	281	58	339
SCCO	61	36	67	30	64	31	68	25	260	122	382
SCO	90	31	86	18	98	16	123	16	397	81	478
SUNY	28	35	32	25	33	27	34	25	127	112	239
TOSU	42	20	43	14	44	14	45	14	174	62	236
UAB	25	16	29	14	24	13	22	13	100	56	156
UCB	40	28	41	24	41	23	47	25	169	100	269
UH	60	40	63	29	68	30	66	22	257	121	378
UMSL	21	11	24	8	17	9	26	5	88	33	121
U.S. TOTALS	781	406	769	299	812	301	886	285	3248	1291	4539

1983-84 Annual Survey of Optometric Educational Institutions

Minority Group Students Enrolled

	Black American		Spanish Surname		Native American Ind.		Asian Amer.		Foreign Nationals		TOTALS			% of Student
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total	body
FSC	1	0	0	0	0	0	0	0	1	0	2	0	2	1.68
ICO	4	2	12	2	0	0	19	10	5	1	40	15	55	10.36
IU	5	6	7	1	1	0	2	3	1	0	16	10	26	10.44
NECO	3	1	1	0	0	0	7	2	6	4	17	7	24	6.78
NSU	0	0	2	0	7	3	0	0	0	0	9	3	12	12.77
PCO	9	10	5	4	0	0	10	9	6	3	30	26	56	9.59
PU	0	0	8	0	0	0	29	9	10	1	47	10	57	16.81
SCCO	1	3	9	9	0	0	47	35	0	0	57	47	104	27.23
SCO	5	6	10	1	1	1	7	2	5	0	28	10	38	7.95
SUNY	2	5	5	3	0	0	3	4	1	0	11	12	23	9.62
TOSU	2	0	0	0	0	0	0	1	0	0	2	1	3	1.27
UAB	4	2	0	2	0	0	0	1	0	0	4	5	9	5.77
UCB	6	4	16	4	1	1	38	38	0	0	61	47	108	40.15
UH	2	1	15	7	2	0	9	6	10	7	38	21	59	15.61
UMSL	2	2	0	0	0	1	2	0	0	1	4	4	8	6.61
U.S. TOTALS	46	42	90	33	12	6	173	120	45	17	366	218	584	12.87